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(54) Title: WASTE AND ODOR MITIGATION COMPOSITION AND SUBSTRATE

(57) Abstract

A composition for either odor or waste mitigation is disclosed. For deodorizing liquid containing waste receptacles the invention comprises an odor neutralizing compound adsorbed on a particulate substrate. The buoyancy of the substrate is such that the surface area of said substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of the particles residing within the liquid. In the preferred embodiment, the odor neutralizing compound is chlorophyll and the substrate is cork. The average diameter of the cork particles is preferably less than one millimeter. The composition can optionally comprise a fragrance additive adsorbed on the susbtrate particles. For waste mitigation, a microorganism is adsorbed on a particulate substrate. In the preferred embodiment where the waste is oil, the microorganism is an anaerobic bacteria and the substrate is cork. The average diameter of the cork particles is preferably less than one millimeter.

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WASTE AND ODOR MITIGATION COMPOSITION AND SUBSTRATE

This is a continuation-in-part of my prior United States national application Serial No. 07/526,043, filed May 18, 1990 which is pending.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a substrate for carrying either waste mitigation agents or odor mitigation agents and more particularly to a substrate on which substances effective in the degradation, mitigation and dispersal of waste materials, such as oil degrading microorganisms or odor neutralizing compositions, can be carried, maintained and delivered to a waste site.

2. Background of the Invention

Waste handling and treatment is a rapidly growing field in which new, environmentally safe treatment means and methods are continually sought. Waste is found in a number of locations varying from oil spills on the high seas to toxic landfill dumps to human wastes. As used herein, the term "landfill" is a shorthand term for municipal garbage dumps, toxic waste dumps, oil field waste pits, as well as land contaminated by runoff from materials stored on the land. One age old problem that arises in these waste areas is malodorous vapors arising from wastes. A more recent problem commonly encountered in treating all wastes is the lack of a means for transmitting modern treatment agents to the waste site.

Significant advances have been made in the employment of microorganisms to mitigate the adverse environmental effects of pollutants, waste disposal sites, sewage, harbor wastes and oil spills. Even cyanide, a powerful environmental poison, can now be mitigated and destroyed by microorganisms, albeit very slowly. The use of such microorganisms has been hampered by the unavailability of substrates to effectively carry the microorganisms to the pollution site.

The delivery of both waste mitigation agents and odor mitigation agents to waste sites in which those agents are to be employed can be particularly problematic where the agents are not easily handled in bulk. For example, in an oil spill on the high seas, it is desirable to treat the spill with microorganisms, such as bacteria, which degrade and disperse the discharged oil. Such oil degrading microorganisms are generally anaerobic, and become ineffective upon exposure to oxygen in the air. It is therefore difficult to deliver such microorganisms to the location of the oil spill on the surface of the water without diminishing their effectiveness in the process. Similarly, in the degradation of landfills and chemically polluted soil, it is difficult to deliver agents that degrade such waste materials without diminishing their effectiveness in the delivery process.

Waste mitigation in landfills is further complicated by an inability to distribute waste treating microorganisms evenly throughout the landfill. A waste mitigation agent is difficult to apply to a landfill where the agent is not visible to the naked eye and thorough mixing into the landfill is nearly impossible to obtain. Applying a waste mitigation agent to a landfill evenly is easily accomplished when the waste mitigation agent is

bound to an environmentally sound substrate. The substrate may be visibly distributed evenly in the required amounts to the landfill to be treated.

Currently, treatment of waste spills on water, especially oil, is difficult due to distribution difficulties, weather conditions and transportation means. This difficultly was most recently seen in the immense Alaskan oil spill of 1989 and more recently in the Persian Gulf. The waste mitigation agent must be applied to the waste floating on the water in a manner which maintains the waste mitigation agent in contact with the waste. Presently, this often means dispersing liquid treating agents from water craft or aircraft using buckets or spray devices. In such treatments, it is difficult to effectively distribute the treating agents and these agents often merely mix with uncontaminated water and drift off without affecting the waste product in the water.

In mitigating wastes disposed in liquid environments, the buoyancy of a carrier, that is, its ability to serve as a flotation medium, can profoundly affect its ability to serve as a substrate in waste mitigation. Effective substrates for waste mitigation substances for use in liquid environments must not only serve as carriers for such substances (e.g., micro-organisms, chlorophyll and the like), but also exhibit controlled buoyancy such that an appropriate portion of the surface area containing the waste mitigation substance maintains an appropriate contact with the atmosphere and with the liquid.

In certain applications, such as odor neutralization, it is desirable that the treated substrate project and maintain as much of the odor neutralizing compound as possible above the surface of the liquid in order that the compound can neutralize the odors in the

vapor space of a waste receptacle. In addition, the treated substrate should float so that organic wastes such as fecal waste and vomitus deposited into the waste receptacle become coated with the treated substrate upon deposit.

In other applications, such as oil spill mitigation, it is desirable that the treated substrate float lower, thus projecting and maintaining as much of the oil consuming anaerobic microorganisms as possible below the surface of the floating oil. This floating posture ensures that the microorganisms are kept from exposure to the oxygen containing environment above the surface of the water which would kill the anaerobic microorganisms, while maintaining the anaerobic microorganisms within the floating oil. In such applications of microorganisms, it is also desirable to include within the substrate a nutrient to maintain the microorganism until it is ready to be employed. In time, aerobic microorganisms may be developed which will devour or modify oil spills. However, such microorganisms are not yet known. Once developed, the treatment method of the invention should be equally applicable to both aerobic and anaerobic microorganisms.

Mitigation of odors from waste products, especially organic waste products such as human urinary and fecal wastes, is an especially troublesome task. At sanitary waste treatment facilities, odors carried by the winds are objectionable to both the workers at the treatment facility and to those who live or travel in the area surrounding the facility. Odor control at these facilities where aeration ponds and clarifier systems are used, must be accomplished without reducing the capacity of the treatment system and without plugging the operating equipment. The odor mitigating agent must be effectively delivered to the odoriferous waste itself.

In hospitals and nursing homes, bed pan contents as well as vomitus are a constant source of malodorous vapors with which both the patient and the workers must contend. In addition, patients who have undergone intestinal surgery sometimes require colostomy or ileostomy bags to collect wastes, which must be removed and disposed of in waste containers. For medical staff members, the presence of waste odors can create discomfort and detrimentally affect the performance of medical duties. For patients, waste odors can create discomfort and embarrassment, thereby compounding the misery of illness. In addition, odor control agents used in these circumstances must be compatible with the eventual municipal waste collection and treatment system.

In hospitals and nursing homes, as well as the home, waste products are normally deposited into receptacles, such as a toilet, which contain liquid, usually water, for carrying the waste to a sewer or septic system. Other organic waste disposal devices include portable toilets, in-ground campsite toilets, marine toilets, as well as aircraft, train and motor vehicle toilets. All of these traditional organic waste collection systems present odor control considerations which must be addressed by means which will not cause difficulties in the ultimate waste treatment facility.

It has long been known that chlorophyll, the green photosynthetic extract from plants, neutralizes odors emanating from organic materials. Several animal litter formulations employ chlorophyll and a variety of porous substrates. Conventional animal litter substrates include clays, corncob grits, comminuted popcorn, and chopped paper. However, the primary purpose of animal litter is to absorb and contain animal urinary and fecal waste. Once the odor defeating agent contained on the litter sinks

beneath the surface of any liquid present, the odor controlling ability of the litter is defeated. Conventional animal litter is therefore unsuitable for use in neutralizing odors in liquid containing waste receptacles, such as toilets, because the substrate rapidly absorbs water and sinks. Thus, conventional animal litter is ineffective as a toilet deodorizer because it will not remain floating on the surface of the water into which the odoriferous waste is deposited.

Cork is a particularly effective, environmentally safe substrate material for odor and waste mitigation purposes, and can be treated with such substances as oil consuming microorganisms, chlorophyll, dyes and fragrances. Cork is the elastic, tough outer tissue of the cork oak. When cork is finely comminuted into particles, it exhibits the ability to become coated and the cells impregnated with a thin layer of chlorophyll, in the case of odor neutralizing compositions, and then retain the chlorophyll on the surface of the cork particles and in the hollows of the cork cells.

For use in the waste mitigation of oil, either in oil spills on water or oil contaminated landfills, finely comminuted cork exhibits the ability to adsorb microorganisms including anaerobic bacteria, and then retain the microorganisms and maintain their effectiveness. Where greater amounts of waste mitigation agent are required, the cell structure of cork may be utilized such that microorganisms may be stored in the interstices of the cork particles. In the case of anaerobic bacteria, a coating impervious to air can be applied to cover various sized dosages of the anaerobic bacteria-cork combination such that these oil-mitigating microorganisms can be delivered to the oil-spill area. Additionally, nutrients for microorganisms may also be applied to the cork and

within the cells of the cork to allow storage of the bacteria-cork combination for substantial periods of time within this coating impervious to air.

Cork particles are especially suited for use as an odor or waste mitigation substrate as they exhibit sufficient buoyancy such that the amount of surface area projecting above or below the liquid can be selected and controlled depending upon the application. For example, in odor neutralization applications which require high flotation on the liquid, the cork particles should exhibit sufficient buoyancy such that the surface area of the cork particles which projects from the liquid contained in the waste receptacle is at least as great as the surface area which resides within the liquid. In treating floating waste, such as an oil spill, the treated substrate should float with a majority of the substrate below the fluid surface.

OBJECTS OF THE INVENTION

In accordance with the foregoing, it is therefore an object of the invention to provide a floatable substrate on which substances, such as oil consuming microorganisms, dyes, odor neutralizing compositions, and fragrances, can be carried to deliver the substance to a liquid environment.

A further objective is to provide a substrate that can be used in the treatment of landfill wastes.

Another object of the invention is to provide a floatable substrate in which the substrate particles project selectively above and below the liquid in which the substrate is delivered.

A still further object of the invention is to provide a floatable substrate for adsorbable substances that is easy and economical to prepare and use.

A still further object of the invention is to provide a substrate that is easy and economical to prepare and use.

Other objects, advantages and features of the invention will become apparent upon reading the following summary of the invention, detailed description and appended claims.

SUMMARY OF THE INVENTION

These and other objects are achieved by a composition for mitigation of odors and wastes. The composition comprises an odor neutralizing compound or waste mitigation compound adsorbed on or within a particulate substrate. The usual buoyancy of the substrate is such that the surface area of the substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of the particles residing within the liquid.

In one preferred embodiment for use in odor control, the odor neutralizing compound is a chlorophyll complex which may be a chlorophyll-copper complex, and the substrate is cork. The average diameter of the cork particles is preferably less than one millimeter. The composition can optionally comprise a fragrance additive adsorbed on the substrate particles.

A method of preparing a composition for neutralizing odors imparted by organic waste products deposited in a liquid containing waste receptacle is also provided. The method comprises the steps of:

(1) forming a particulate substrate having a buoyancy such that the surface area of the substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of the particles residing within the liquid, and

(2) adsorbing an odor neutralizing compound on the substrate particles.

In the preferred method, the odor neutralizing compound is chlorophyll and the substrate is cork. The average diameter of said cork particles is preferably less than one millimeter. If desired, a fragrance additive can also be adsorbed on the substrate particles.

A method of neutralizing odors imparted by organic waste products deposited in a liquid containing waste receptacle is also provided. The method comprises introducing into the waste receptacle a composition comprising an odor neutralizing compound adsorbed on a particulate substrate. The buoyancy of the substrate in this instance is such that the surface area of the substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of the particles residing within the liquid. In the preferred method, the odor neutralizing compound is chlorophyll and the preferred substrate is cork.

In the preferred embodiment of the invention for use in waste mitigation for either landfill waste or waste floating on water, the composition comprises a waste mitigating microorganism adsorbed on a particulate substrate. When treating oil or other hydrocarbon waste, in those cases when the preferred waste mitigation agent is an anaerobic bacteria, an outer layer of material impervious to air may surround the substrate of tiny cork particles, the diameter depending upon the exact waste to

be-attacked. The average diameter of the cork particles is preferably less than one millimeter. The composition can optionally comprise a nutrient to aid in maintaining the microorganism.

The cork may also optionally have its cell structure partially attacked such that additional amounts of microorganisms and nutrients may be stored in some interstitial cell spaces. Additionally, the composition may optionally be encapsulated in a slowly or rapidly decaying encapsulating substance to prohibit contact with oxygen which might destroy the microorganism prior to application to the oil spill. This outer capsule-like layer impervious to air would break open or preferentially dissolve and release the tiny cork particles impregnated with microorganisms when striking the oil spill.

A method of mitigating oil spills on water is also provided. The method comprises introducing into the oil spill a composition comprising an oil consuming microorganism adsorbed on a particulate substrate. The buoyancy of the substrate is such that the surface area of the substrate particles projecting into the air above the oil is less than the surface area of the particles residing within the liquid. The density of the cork and the amount and type of additive material will determine the level of flotation. In the preferred method, the waste mitigation agent is an anaerobic bacteria and the preferred substrate is cork having a diameter of less than one millimeter.

A method of mitigating waste in landfills is also provided. The method comprises introducing into the landfill a composition comprising a microorganism adsorbed on a particulate substrate. In the preferred method, the waste mitigation agent is a microorganism chosen to attack the waste found in the landfill and the preferred substrate is cork having a diameter of less than one millimeter. The

composition can be plowed into the landfill or placed through holes dug throughout the landfill to the various depths needed to assure mitigation and alternation of the offending waste product.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

ODOR MITIGATION

The present deodorizing composition effectively neutralizes odors imparted by organic waste products deposited in liquid containing waste receptacles. As used herein, the term "toilet deodorizer" is a shorthand term for a composition that neutralizes organic waste odors in liquid containing receptacles. The components of the present composition are:

(a) a buoyant, particulate substrate, preferably cork;

(b) an odor neutralizing compound, preferably a chlorophyll complex adsorbed onto the substrate; and

(c) optionally, a fragrance additive.

The substrate of the present toilet deodorizer is porous and capable of adsorbing (i.e., becoming coated by) the odor neutralizing compound. The substrate also exhibits buoyancy in the liquid contained in the waste receptacle. When the substrate is finely comminuted into particles, the surface area of the substrate particles projecting from the liquid in the waste receptacle is at least as great as the surface area of the particles residing within the liquid. The substrate can be comminuted by hand or mechanical means, such as by grinding or chopping by a household blender or by a large commercial chopping machine, into fine particles or pellets. The average diameter of the comminuted particles is preferably

less than about one millimeter so as to produce particles having a substantial surface area and yet, at the same time, be small enough to economically dispense using shaker containers, for example.

The preferred substrate is cork. Cork is conveniently comminuted into particles, as described above, and is porous and capable of adsorbing and becoming coated by water soluble odor neutralizing compounds such as chlorophyll. Cork also exhibits favorable buoyancy characteristics. Further, cork, as a naturally occurring wood product, is environmentally safe, nontoxic, and is a renewable resource whose use does not lead to further environmental blights.

After the substrate is formed into particles, the odor neutralizing compound is adsorbed and coated on the substrate by first forming a concentrated solution of the odor neutralizing compound and then placing the substrate particles into the concentrated solution. The preferred odor neutralizing compound is chlorophyll, which can be obtained commercially from pharmaceutical suppliers, such as, for example, Derifil brand chlorophyll complex (internal deodorant film coated tablets or liquid chlorophyll) from Rystan Company, Inc. of Little Falls, New Jersey or powdered substantially pure chlorophyll available from Miki Sangyo U.S.A., Inc., of New York, New York. Also, to increase the shelf life of the product, a small amount of triethylene glycol can be mixed in the compound. The substrate particles are mixed with the concentrated solution for sufficient time to adsorb the odor neutralizing compound. The treated particles are then dried in air for a sufficient time that the particles do not adhere when compressed for packaging and storage.

If a scented deodorizer is desired, a fragrance additive can be introduced into the concentrated solution prior to soaking the substrate particles in the solution. Typical fragrance additives include peppermint, spearmint, cinnamon, vanilla, berry and perfume extracts.

In use, the toilet deodorizer is distributed in the waste receptacle, preferably before wastes are introduced. The deodorizer can be sprinkled directly onto the liquid contained in the receptacle. In the case of a regular toilet, the particles can be more evenly suspended on a length of toilet paper extending the diameter of the bowl. The deodorizer is carried into the sewer or septic system along with the other waste materials.

EXAMPLE 1

A quantity of cork obtained commercially in sheet form is comminuted using a household blender into particles having a diameter of approximately one millimeter or less. In a separate vessel, a concentrated solution of chlorophyll is prepared by dissolving in water and acetone or alcohol certain amounts of Derifil brand chlorophyll tablets or powdered substantially pure chlorophyll, to which a tiny amount of triethylene glycol is added to lengthen shelf life. The chlorophyll solution is then mixed with the cork particles in the blender. The chlorophyll laden cork particles are then dried in air for a time sufficient to prevent the particles from adhering. The resulting deodorizer composition is effective in substantially reducing urinary, fecal and vomitus waste odors in toilets and other liquid containing waste receptacles.

EXAMPLE 2

Cork in sheet form was comminuted into particles as described in Example 1. A concentrated chlorophyll solution was also prepared as described in Example 1. A small amount of concentrated peppermint extract was added to the chlorophyll solution. The chlorophyll and fragrance solution was then mixed with the cork particles in the blender. The treated cork particles were then dried in air for a time sufficient to prevent the particles from adhering. The resulting scented deodorizer was effective in substantially reducing urinary and fecal waste odors in toilets and other liquid containing waste receptacles, and imparted a pleasant peppermint fragrance to the waste receptacles after use.

WASTE MITIGATION

The present waste mitigation composition effectively neutralizes wastes both in a floating environment such as an oil spill on water and in a landfill environment. The components of the present composition are:

(a) a buoyant, particulate substrate, preferably cork for a floating environment, but other particulate substrates are reasonable for landfills;

(b) a waste mitigation microorganism, preferably an anaerobic bacteria when the waste to be treated is oil, adsorbed on the substrate.

Due to the difficult conditions experienced in treating waste spills on water, especially oil, an all purpose substrate is required to carry the microorganisms capable of destroying the waste. The substrate of the waste mitigation composition is minimally porous and

capable of adsorbing (i.e., becoming coated by) the waste mitigating compound. The substrate also exhibits buoyancy in both water and wastes floating on water allowing the treatment of wastes floating on water. The substrate can be comminuted by hand or mechanical means, such as by grinding or chopping by a household blender or by a large commercial chopping machine, into fine particles or pellets. The average diameter of the comminuted particles is preferably less than about one millimeter to allow maximum dispersal over a large surface area while using a minimal amount of material.

Where the waste mitigation compounds used are adversely affected by exposure to the atmosphere during transport to the waste site, an amount of substrate treated with the mitigation compound may be encapsulated in a material impervious to air in order to exclude oxygen in the air which would destroy the anaerobic bacteria. When the encapsulated substrate is used to treat oil, a hydrocarbon soluble coating is appropriate. In such applications as landfills, a water soluble coating is appropriate. Further, the coating may be broken down using mechanical force such as plowing a landfill or by impact due to being dropped from a sufficient elevation.

In the case of transporting the particles of cork containing the anaerobic or other living organisms to an oil spill, the outer impervious covering that contains the tiny cork particles impregnated with organisms could vary from a centimeter to a meter in size, depending upon the type of ship or plane from which the balls of material were to be dropped, the force of impact expected when the oil spill would be struck, etc. Whether the fresh or salt water or oil would dissolve the encapsulating coating, and expose the substrate plus organisms to the waste or fresh water, or simply the impact of striking the water would be

determined by exact situations. The presence of the impervious outer layer would also prevent inadvertent dispersal of microorganism, whether aerobic or anaerobic, prior to being placed in the area to be treated.

The preferred waste mitigation substrate is cork. Cork is conveniently comminuted into particles, as described above, and is capable of adsorbing and becoming coated by waste mitigating microorganisms such as anaerobic bacteria. Cork also exhibits favorable buoyancy characteristics for waste mitigation applications.

After the substrate is formed into particles, the waste mitigating microorganism, such as anaerobic bacteria, is adsorbed and coated on the substrate. The treated particles are then dried and, where exposure to air will destroy the microorganism, placed within a coating material impervious to air. This impervious coating could be dissolved by coming into contact with moisture, hydrocarbons, or broken by impact. The treated substrate may then be packaged and stored. Where long-term storage of the product is contemplated, the substrate should be further treated with nutrients to sustain the microorganisms during storage. Cold storage would further diminish the nutrient needs of the microorganism.

In use, the waste mitigation composition is distributed over the contaminated water. This method comprises introducing into the oil spill a composition comprising an oil consuming microorganism adsorbed on a particulate substrate. The buoyancy of the cork substrate is such that the substrate particles are substantially within the layer of floating oil, because all anaerobic bacteria projecting into the air above the oil would immediately die, and the bacteria in the cork particles falling into the water would also die because water contains oxygen. In the preferred method, the waste

mitigation agent for oil is an anaerobic bacteria and the preferred substrate is cork having a density such that the cork particles will be just below or at the surface of the oil spill.

As the substrate is easily visible, the composition can easily be distributed evenly across a waste site. The composition may be distributed by water craft or by aircraft without fear of harm to the environment. To further increase the visibility of the waste mitigation composition when treating waste spills on water, a dye may be adsorbed onto the substrate. The dye will impart color to the surface of the water, further allowing the initial distribution of the waste treatment to be determined.

The same ease of transport and ease of visibility due to the substrate is equally useful in the treatment of a landfill using the waste mitigation composition. The properties of adsorption and the ability to alter the cell structure of the cork to increase the microorganism carrying capability of the cork make the use of the composition also particularly useful in the treatment of landfills. Of important economic concern also is the potential ability to use the same composition for treating oil spills on the high seas as well as for treating oil contaminated landfills.

The method for treating landfills comprises introducing into the landfill a composition comprising a microorganism adsorbed on a particulate substrate. In the preferred method, the waste mitigation agent is a microorganism chosen to attack the waste found in the landfill and the preferred substrate is cork. As in treating floating wastes, the composition of the invention may be encapsulated in an encapsulating coating. If the microorganism is anaerobic, the encapsulation would prohibit contact by the composition with oxygen which would

destroy the microorganism prior to application to the waste. The encapsulation must protect the waste mitigation composition while at the same time being capable of breaking down upon contact with the waste with sufficient rapidity to treat the waste. Such encapsulating means could be removed due to dissolution upon contact with moisture similar to the encapsulation used in oral medications, or by other mechanisms such as mechanical force suitable to the waste to be treated. In landfills, the degradation of the outer protective layer would initiate the chosen microorganism's attack upon the pollutant.

While particular embodiments have been set forth herein, alternative odor neutralizing compositions would achieve similar results. Alternative embodiments and various modifications will also be apparent from the above description to those skilled in the art. These and other equivalent alternatives are considered within the spirit and scope of the invention.

What is claimed is:

1. A composition for neutralizing odors imparted by organic waste products deposited in a liquid containing waste receptacle, said composition comprising an odor neutralizing compound adsorbed on a particulate substrate, the buoyancy of said substrate such that the surface area of said substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of said particles residing within the liquid.

2. The composition of claim 1 wherein said odor neutralizing compound is chlorophyll.

3. The composition of claim 1 wherein said substrate is cork.

4. The composition of claim 3 wherein the average diameter of said cork particles is less than one millimeter.

5. The composition of claim 1 further comprising a fragrance additive adsorbed on said substrate particles.

6. A toilet deodorizer composition comprising chlorophyll adsorbed on finely comminuted cork particles, the average diameter of said cork particles less than one millimeter, the surface area of said cork particles projecting from the liquid contained in the toilet being at least as great as the surface area of said particles residing within the liquid.

7. The composition of claim 6 further comprising a fragrance additive adsorbed on said cork particles.

8. A method of preparing a composition for neutralizing odors imparted by organic waste products deposited in a liquid containing waste receptacle, said method comprising the steps of (1) forming a particulate substrate, the buoyancy of said substrate such that the surface area of said substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of said particles residing within the liquid, and (2) adsorbing an odor neutralizing compound on said substrate particles.

9. The method of claim 8 wherein said odor neutralizing compound is chlorophyll.

10. The method of claim 8 wherein said substrate is cork.

11. The method of claim 10 wherein the average diameter of said cork particles is less than one millimeter.

12. The method of claim 8 further comprising a fragrance additive adsorbed on said substrate particles.

13. A method of preparing a toilet deodorizer composition comprising the steps of (1) comminuting cork such that the average diameter of the resulting cork particles is less than one millimeter, the surface area of said cork particles projecting from the liquid contained in

the toilet being at least as great as the surface area of said particles residing within the liquid, and (2) adsorbing chlorophyll on said cork particles.

14. The method of claim 13 further comprising the step of adsorbing a fragrance additive on said cork particles.

15. A method of neutralizing odors imparted by organic waste products deposited in a liquid containing waste receptacle,said method comprising introducing into said waste receptacle a composition comprising an odor neutralizing compound adsorbed on a particulate substrate, the buoyancy said substrate such that the surface area of said substrate particles projecting from the liquid contained in the waste receptacle is at least as great as the surface area of said particles residing within the liquid.

16. The method of claim 15 wherein the odor neutralizing compound is chlorophyll.

17. The method of claim 15 wherein said substrate is cork.

18. The method of claim 17 wherein the average diameter of said cork particles is less than one millimeter.

19. The method of claim 15 wherein said composition further comprises a fragrance additive adsorbed on said substrate particles.

20. A method of deodorizing toilets containing organic waste products, said method comprising introducing into said toilet a composition comprising chlorophyll adsorbed on finely comminuted cork particles, the average diameter of said cork particles less than one millimeter, the surface area of said cork particles projecting from the liquid contained in the toilet being at least as great as the surface area of said particles residing within the liquid.

21. The method of claim 20 wherein said composition further comprises a fragrance additive adsorbed on said cork particles.

22. A composition for waste mitigation, said composition comprising a waste mitigating microorganism adsorbed on a particulate substrate.

23. The composition of claim 22 wherein said microorganism is an anaerobic bacteria.

24. The composition of claim 22 wherein said substrate is cork.

25. The composition of claim 24 wherein the average diameter of said cork particles is less than one millimeter.

26. The composition of claim 22 further comprising microorganism nutrients.

27. The composition of claim 22 further comprising a dye adsorbed onto the substrate.

28. A method of mitigating waste spills floating on water, said method comprising introducing into the waste spill a composition comprising a waste consuming microorganism adsorbed on a particulate substrate.

29. The method of claim 28 further comprising encapsulating quantities of the waste consuming microorganism adsorbed on a particulate substrate within an outer protective layer, said outer protective layer disintegrating upon the application of mechanical force to expose the adsorbed microorganism.

30. The method of claim 28 further comprising encapsulating quantities of the waste consuming microorganism adsorbed on a particulate substrate within an outer protective layer, said outer layer dissolving upon contact with hydrocarbons.

31. The method of claim 28 further comprising encapsulating quantities of the waste consuming microorganism adsorbed on a particulate substrate within an outer protective layer, said outer layer dissolving upon contact with water.

32. The waste mitigation method of claim 28 wherein said microorganism is an anaerobic bacteria.

33. The method of claim 28 wherein said substrate is cork.

34. The method of claim 28 wherein the average diameter of said cork particles is less than one millimeter.

35. The method of claim 28 wherein said composition further comprises a dye.

36. A method of mitigating waste in landfills, said method comprising introducing into the landfill a composition comprising a microorganism adsorbed on a particulate substrate.

37. The method of claim 36 further comprising encapsulating quantities of the oil consuming microorganism adsorbed on a particulate substrate within a slowly decaying encapsulaing means.

38. The waste mitigation method of claim 36 wherein said microorganism is an anaerobic bacteria.

39. The waste mitigation method of claim 36 wherein said microorganism is an aerobic bacteria.

40. The method of claim 36 wherein said substrate is cork.

41. The method of claim 36 wherein the average diameter of said cork particles is less than one millimeter.

42. The method of claim 36 further comprising encapsulating quantities of oil consuming microorganisms adsorbed on a particulate substrate within an encapsulating means which can be broken down by the application of mechanical force.

INTERNATIONAL SEARCH REPORT

International Application No PCT/US91/03298

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC(5): A61K 9/00
U.S. CL. 424/400

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
U.S.	424/400

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No [13]
Y	US, A, 3,884,804 (ROBINSON) 20 MAY 1975 See entire document.	1,3-4,8,10-11,15,17-18,19-42
Y	US, A, 4,919,925 (UEDA) 24 APRIL 1990 See entire document.	1,3-4,8,10-11 15, 17-42
Y	US, A, 4,251,508 (MONSOD, JR.) 17 FEBRUARY 1981; See entire document.	1,3-4,8,10-11 15,17-42

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [1]	Date of Mailing of this International Search Report [1]
16 July 1991	12 SEP 1991
International Searching Authority [1]	**Signature of Authorized Officer [14]**
ISA/US	William Benston, Jr.

Form PCT/ISA/210 (second sheet) (January 1985)